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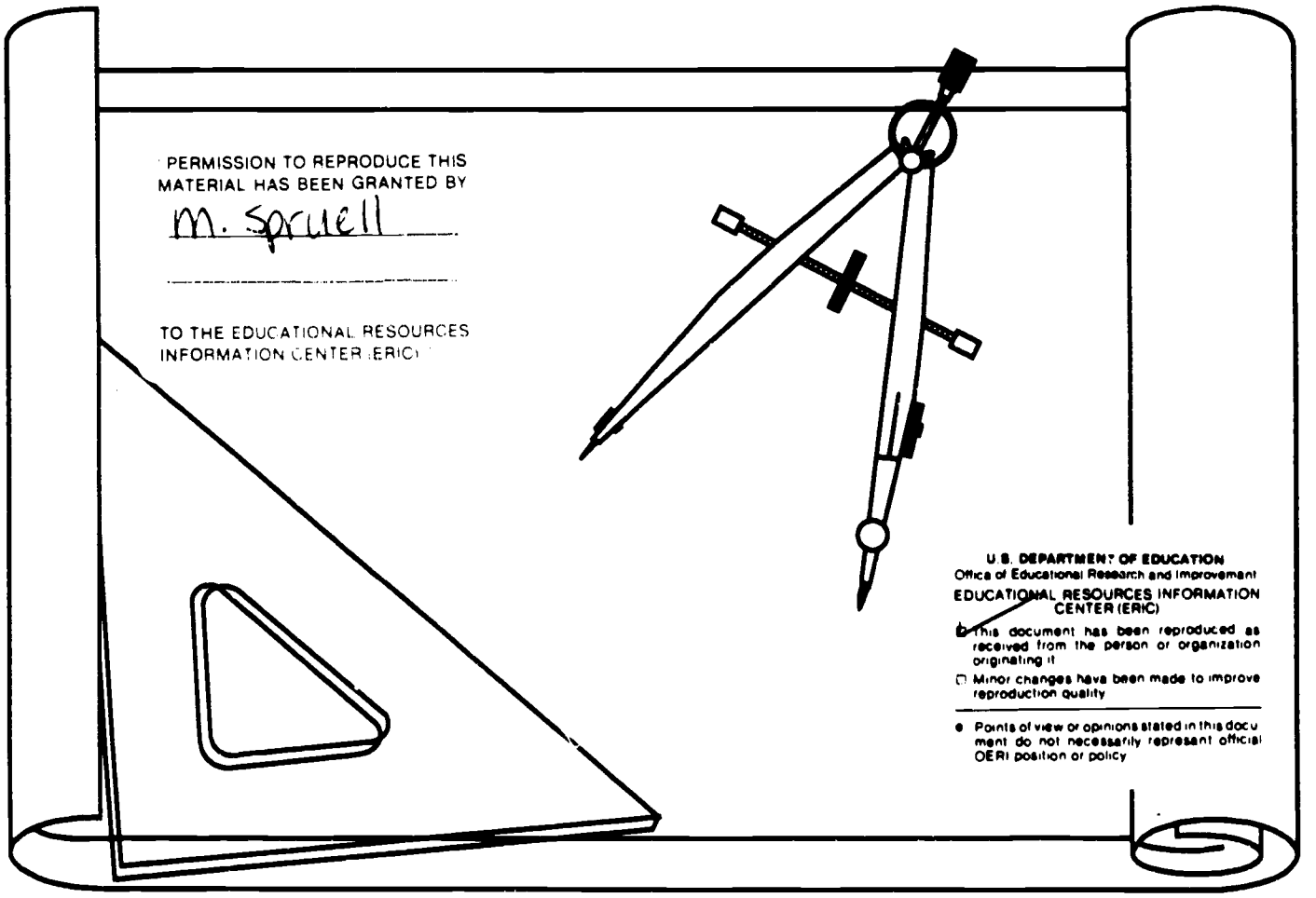
ABSTRACT

This energy education unit contains activities and classroom management strategies that emphasize cooperative learning and peer teaching. The activities are designed to develop students' science, math, language arts, and social studies skills and knowledge. Students' critical thinking, leadership, and problem solving skills will be enhanced as they code and decode clues in Energy Enigma, make predictions in the Science of Energy, or when they assign dollar amounts to answers in Energy Jeopardy. This blueprint gives a brief description of 41 activities, the amount of time needed to complete each activity, and the range of appropriate grade levels. To meet the ability levels of different students, each activity contains alternate methods for conducting the activity. The unit also contains student and teacher evaluation forms and an examination. (JRH)

Blueprint for Success

An Energy Education Unit Management Plan



Developed by the National Energy Education Development Project

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Energy Unit Objectives

Upon completion of the energy unit, students will be able to accomplish the following objectives:

The Science of Energy

- List and explain five things energy enables us to do.
- Differentiate between sources of energy and forms of energy.
- Describe six forms of energy and give an example of each.
- Explain how one form of energy is converted to other forms of energy.
- Trace the energy conversion flow of any system back to nuclear energy.

Sources of Energy

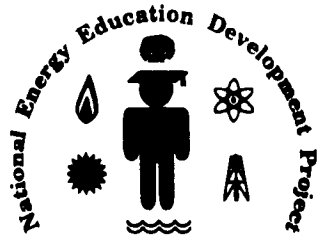
- List the nation's top ten sources of energy and classify them as renewable or nonrenewable.
- Explain how each energy source was formed or is produced, and the historical role of the source.
- Locate where sources of energy are found in the nation, and the major uses of each source.
- Debate the economic and environmental advantages and disadvantages of each source of energy—today and in the future.

Electric Power Generation

- Explain what electricity is, and why it's called a secondary form of energy.
- Explain the historical events and people responsible for the growth of the electric power industry.
- Describe how different sources of energy are used to generate electric power.
- Explain the steps used to bring electric power from the power plant to your home.
- Discuss the electric power challenges and choices the nation will face in the future.

Energy Efficiency

- Explain the term energy efficiency, and how increased efficiency has reduced the nation's need for energy.
- Explain and practice energy efficient behaviors at home, school, and in transportation.
- Debate and discuss the economic, environmental, and social impacts of certain energy efficiency policies and actions.



Introduction

The energy education unit you are about to embark on will be a unique one, and one we hope you make a regular part of your course of studies. Students play a major role in their own learning and that of others. The activities and classroom management strategies emphasize cooperative learning and peer teaching. Students' critical thinking, leadership, and problem solving skills will be enhanced as they code and decode clues in *Energy Enigma*, make predictions in the *Science of Energy*, or when they assign dollar amounts to answers in *Energy Jeopardy*.

Energy is the perfect theme for a multi-disciplinary unit. NEED's activities are designed to develop students' science, math, language arts, and social studies skills and knowledge. If you are team teaching, NEED activities are a good way to encourage students and teachers to work together on a common theme. All "non" science activities are identified on pages eight and nine—use these activities to involve other team members in your energy unit.

This blueprint will give you a brief description of 41 activities, along with the amount of time needed to complete each activity. Many of NEED's activities are appropriate for a broad range of grade levels. To meet the ability levels of your students, each NEED activity also contains alternate methods for conducting the activity. Activities that are only appropriate for older students are noted in the blueprint.

Energy Unit Exam Answers

1. d	9. a	17. c	25. b	33. a	41. a	49. a	57. b
2. a	10. c	18. b	26. a	34. b	42. b	50. a	58. c
3. a	11. b	19. b	27. b	35. c	43. b	51. a	59. b
4. d	12. b	20. b	28. a	36. b	44. b	52. b	60. b
5. d	13. a	21. a	29. c	37. b	45. d	53. a	61. c
6. d	14. b	22. b	30. c	38. d	46. b	54. b	62. b
7. c	15. b	23. d	31. a	39. b	47. b	55. b	
8. b	16. b	24. c	32. d	40. d	48. a	56. d	

Seven Steps to Building Your NEED Program

To build a comprehensive and effective NEED program, you should complete all seven steps in the suggested sequence. You will need to decide which activities you want to use for each of the following steps. The length of the unit will be determined by the number of activities you choose and the way you choose to conduct the activities. If you are team teaching, you may choose certain activities for members of your team.

Step One—Getting Organized

Your first step is to select the activities you will use for steps two through six. Next, organize students into groups. Students usually serve in a core group for about half of the unit and are jigsawed in several other groups for several activities. Forms and charts are included to efficiently assign students to activity groups.

Step Two—The Science of Energy

Students need to learn the science of energy before they can learn about the sources of energy, electric power production, and energy efficiency. Students learn the six forms of energy and how one form is converted into other forms.

Step Three—Sources of Energy

Once students know the forms of energy, they are ready to learn about the ten sources of energy. The NEED Project recommends you begin Step Three with *Transparent Energy* for older students and *Energy Chants* for younger students.

Step Four—Electric Power Generation

NEED activities will provide your students with information on the generation, transmission, and efficient use of electricity. You may want to give your students basic electricity information before beginning this step.

Step Five—Energy Efficiency

Now that students have learned about energy conversions, sources, and electricity, they are ready to learn about the efficient use of energy. Step Five encourages students to practice energy efficient behaviors and learn about efficiency technologies. This step is also a good opportunity to use local resource people (a utility representative, heating and cooling technician, appliance dealer, or auto technician) to help teach about efficiency.

Step Six—Synthesis and Reinforcement

Students synthesize energy information from the previous four steps and use this information in a variety of challenging and enjoyable games and activities. This step also reinforces what students have already learned. The NEED Project suggests you select at least one synthesis and two reinforcement activities.

Step Seven—Evaluation

Most NEED activities contain evaluation strategies, therefore evaluation is an ongoing activity. Each activity the class participates in is evaluated upon completion, and the entire program is evaluated by the students at the conclusion of the energy unit. To assist teachers with a comprehensive evaluation of the energy unit, the blueprint contains multiple choice questions of varying degrees of difficulty. The correct answers are provided on page four of the blueprint. Essay questions require students to draw upon their knowledge of energy to write an explanation or suggest a plan of action. This written form of evaluation can be done in teams and/or individually. Students also complete a self evaluation of their growth in energy knowledge.

Step One: Getting Organized

1. As early in the school year as possible, administer the *NEED Energy Education Poll* to the participating students. The pre and post Poll results should be used when evaluating the energy unit. Many schools are eligible to receive scanning cards, a class set of polls, and processing of their cards for free. See the list of states offering this free service in the 1996 *NEED Energy Education Poll* booklet in your NEED Local Participation Kit, or call NEED at (800) 875-5029.

2. Select the activities for your energy unit. See the charts on pages eight and nine for a quick overview of NEED's resources and activities. Make sure you select at least one activity for each step (Two through Six). Descriptions of the activities are given in each individual step, along with grade level suggestions and class hours needed to complete the activity. Also included in this blueprint (page 17) are several sample units with activities from each step.

> *Consider securing energy videos and movies that may be available from energy organizations, government agencies, and regional educational media centers. You may also be interested in taking an energy field trip, or having a guest speaker visit your class. Your electric or gas utility can be helpful in this area. Also consider car dealerships or repair stations, appliance sales/service representatives, propane and heating oil dealers, heating and cooling contractors, and other energy related businesses.*

3. Assign students to teams and groups. The blueprint is designed for seven teams of three to five students. These teams work together on major activities and help each other learn. For certain activities, students are jigsawed into Activity Groups. Each member of the team will be responsible for three of 12 energy specialty areas, serving as the team's expert in these areas.

   When assigning students to Working Groups, take into consideration your students' leadership and academic skills. Assign your seven best student leaders to different working groups. The seven Working Groups names (forms of energy) are found on the first page of the NEED Assignment Sheet (page 19). Write these students' names on your Student Tracking Form (page 20). Now select the seven students you think will require the most assistance, and assign each to a different group. Complete the groups with your remaining students.

   As a Working Group, students will participate in several core activities, in academic competition, and perhaps even a final exam. We recommend the following activities be done as a Working Group:

Step 2:	Science of Energy	Step 5:	Electric Connections	Energy Eliminators
Step 3:	Energy Enigma		Electric Puzzles	Energy Match Game
	Rock Performances	Step 6:	Energy Math Challenge	Energy Time Capsule
Step 4:	None		Energy Carnival	Bumper Stumpers

   Working Group members should be assigned to Activity Groups for the remainder of the energy activities. Use the Student Tracking Form when assigning students to activity groups. Once you have assigned students to Working Groups and Activity Groups, transfer this information to each student's NEED Assignment Sheet.

Day One Activities—Instructional Time: 1 to 1.5 hours

Organize by Working Groups

Give students their NEED Assignment Sheets and organize them into Working Groups. Check the Section I and III activities students will be participating in, or have your students check these boxes when you begin the unit. In advance, check the activities and group assignments for Section II. (*Five minutes.*)

After students are organized into Working Groups, review the NEED Energy Unit Objectives (page three) with the class. Refer students to their NEED Assignment Sheet, and explain the activities they will be completing to achieve these goals. (*Ten minutes.*)

Explain how to use the *Energy Education Rating Guide* (elementary or secondary school version) beginning on page 24. Make sure students understand it's OK to rate themselves energy ignorant for many of the items. Assure students that their Energy Education Rating (EER) will improve greatly by the end of the unit. (*Five minutes.*)

Have students work independently to determine their EER. (*Fifteen minutes.*)

Students should now have a brief Working Group meeting. During this session, each group should brainstorm several possible group names. Students must use their Working Group name in their group's name, such as: The Combustible Chemicals, Ernie Electron and the Electricals, or the Mighty Morphin' Mechanicals.

Once the group has chosen a name, students should brainstorm ideas for a poster or pennant that displays the group's name. This assignment can be done at home and should be completed in a few days. (*Ten minutes.*)

In class, or for homework, have students answer the questions in Part One of their NEED Student Evaluation Form (page 22). Explain the evaluation's instructions and the importance of evaluation. Make sure all students complete this section as soon as possible, and evaluate the program activities when they're completed.

Optional Activity

Working Groups can compete for the honor of being the top group. You may want to give awards or prizes to the members of the best Working Group. Base the competition on the groups' performances or presentations, games, and the final unit exam. If you are conducting this unit with several of your classes, you may want to hold a competition (i.e., Energy Bowl or an advanced game of Jeopardy) between the top Working Groups from each class.

Assigning Specialty Areas

Assign each member of the Working Groups to three specialty areas. Make sure each group has members assigned to all 12 areas. If the groups are large, some students can be assigned to the same specialty areas. If the groups are smaller, students can be assigned to four specialty areas. The students' *Transparent Energy*, *Energy Chants*, or *Great Energy Debate Game* assignment will automatically be one of their specialty areas. Explain to the students their responsibilities as group specialists. The group will count on them to master the information for their specialty areas. Students should be ready to teach other members of their Working Group about what they have learned. (*Five minutes.*)

Group Contract

Next, Working Groups should develop their group contracts. Distribute at least two copies of the Group Contract (page 21) to each Working Group. Explain to the groups how they should develop their own contracts. Once the contract has been written and approved by you, each member of the Working Group should sign it. Keep these on file in case you need to get the group, or a member of the group, back on track. (*Fifteen minutes.*)

Item	Resource	Step Two	Step Three	Step Four	Step Five	Step Six	Main Emphasis	Grade Level	Time	Groups	Classes
Secondary Energy Fact Sheets	X						Introduction to energy, ten energy sources, and electricity	7-12			
Elementary Energy Fact Sheets	X						Introduction to energy, ten energy sources, and electricity	4-8			
NEED Energy Education Poll	X						Measures students' energy knowledge and opinions	5-12			
U.S. Energy Geography	X						U.S. maps representing all ten energy sources	5-12			
Energy Exchange	X						Magazine containing articles on the latest energy developments	5-12			
Youth Awards Guide	X						Guidelines for NEED's National Youth Awards Program	5-12			
Science of Energy		X					Forms of energy and energy transformations	7-12	2-4 Hours	Working	Science
Elementary Science of Energy		X					Forms of energy and energy transformations	5-8	2-4 Hours	Working	Science
Forms of Energy Fun		X				X	Reviews forms of energy and energy transformations	5-12	1 Hour	Individual Student	Science
Transparent Energy			X				Introduces the ten major sources of energy	7-12	2.5-3.5 Hours	Activity	Science or English
Energy Chants			X				Introduces the ten major sources of energy	5-6	1.5-2.5 Hours	Activity	Science
Energy Enigma			X			X	Reviews the ten major sources of energy	7-12	2.5 Hours	Working	All
Great Energy Debate Game			X			X	Advantages & disadvantages of the ten sources of energy	5-12	2-4 Hours	Activity	Science or English
Great Energy Rock Performances			X			X	Reviews the ten major sources of energy	5-9	2-4 Hours	Activity	Science or English
Energy Round-Up			X			X	Reviews the ten major sources of energy	5-12	20 Minutes	Entire Class	All
Electric Connections				X			Energy sources' contribution to electric power generation	5-12	30 Minutes	Working	Science or Math
A Current Energy Affair				X			Electric power generation, distribution, and management	7-12	2.5-3.5 Hours	Activity	Science or English
Electric Puzzles				X		X	Introduces or reviews electric power generation	4-9	45 Minutes	Working	All
This Week in Energy Conservation					X		Introduces ways to save energy at home & on the road	5-12	1.5-2.5 Hours	Activity	Science or English
Energy Conservation Contract					X		Students teach family & friends how to be more energy efficient	4-9	1.5-2.5 Hours	Individual Student	Science, Math Social Studies
Most Wanted Energy Wasters					X	X	Reinforces ways to save energy at home & on the road	5-9	1-1.5 Hours	Individual Student	Science or English
Conservation For Our Nation					X	X	Reinforces ways to save energy at home & on the road	4-12	30-40 Minutes	Groups of 8-10 Students	All
NEED Songs						X	Reinforces and encourages energy conservation behaviors	5-9	10-30 Minutes	Entire Class	All
Energy Math Challenge						X	Strengthens maths skills and reviews energy knowledge	5-9	1.5-2 Hours	Working	Science or Math
Museum of Solid Waste and Energy						X	Students create exhibits on solid waste and energy topics	5-12	4-6 Hours	Activity	Science or English

Item	Resource	Step Two	Step Three	Step Four	Step Five	Step Six	Main Emphasis	Grade Level	Time	Groups	Classes
Yesterday In Energy						X	Students learn how energy use has changed in last 100 years	5-9	1-4 Hours	Activity	Science or Social Studies
Energy Around The World						X	Students learn about energy use in different countries	5-9	1.5-2.5 Hours	Activity	Science or Social Studies
Marine Energy						X	Students learn about America's marine mineral resources	7-12	1-4 Hours	Activity	Science or Social Studies
Let's Talk Energy Show						X	Students produce a talk show on a controversial energy topic	7-12	1-5 Hours	Activity or Entire Class	Science or Social Studies
NEED Energy Plays						X	Reinforces energy source and conservation knowledge	5-12	1-5 Hours	Activity	Science or English
Senate Energy Hearings						X	Students conduct a hearing on a controversial energy issue	7-12	1-5 Hours	Activity	Science or Social Studies
Energy Past and Present						X	Students develop a booklet on past and present energy use	5-12	1.5-2.5 Hours	Working	Science or English
Energy Time Capsule						X	Students prepare time capsule showing present energy use	5-12	1.5-3 Hours	Working	Science or Social Studies
Energy Tip Hot Line						X	Strengthens writing skills and reviews energy knowledge	5-9	1-2 Hours	Working	Science or English
Energy Placemats						X	Students use their knowledge of energy to design placemats	5-8	1-1.5 Hours	Working	Science or Social Studies
The Energy Times						X	Students publish a newspaper with energy-related articles	5-12	2-4 Hours	Activity	Science or English
Adopt A Class						X	Students develop energy activities for younger students	5-12	1.5-3 Hours	Working	All
Energize Your Local DJ						X	Students prepare energy tips & contests for local radio stations	5-12	1.5-2.5 Hours	Working	Science or English
Reach Out and Teach Someone						X	Students use their energy knowledge to teach others	7-12	Varies	Entire Class	All
Energy Carnival						X	Students use their knowledge of energy to play carnival games	5-12	1-2 Hours	Working	All
Energy Jeopardy						X	Students provide questions for energy-related answers	5-12	1.5 Hours	Working	All
Energy Eliminators						X	Strengthens brainstorming skills while reviewing energy topics	5-12	20 Minutes	Working	All
Energy Match Game						X	Reviews and reinforces students' energy knowledge	5-12	20 Minutes	Working	All
Energy Squares						X	Reinforces students' knowledge of various energy-related topics	5-12	20 Minutes	Entire Class	All
Energy Source Relay Race						X	Students draw pictures to help others guess an energy source	5-12	20 Minutes	Working	All
Energy Bumper Stumpers						X	Students use energy knowledge to solve license plate stumpers	5-12	15 Minutes	Working	All
Energy Name Game						X	Students use energy knowledge to create new last names	5-12	20 Minutes	Activity	All
Energy Bingo						X	Students meet others while reviewing energy knowledge	5-12	30 Minutes	Entire Class	All

Step Two: The Science of Energy

Upon completion of this step, students will be able to:

- **List and explain five things energy enables us to do.**
- **Differentiate between sources of energy and forms of energy.**
- **Describe six forms of energy and give an example of each.**
- **Explain how one form of energy is converted to other forms of energy**
- **Trace the energy conversion flow of any system back to nuclear energy.**

Science of Energy Experiments

Time: 2 to 4 hours **Grade Level: 5-12**

Appropriate for science classes organized by working groups. Instructions and student handouts can be found in the *Science of Energy* booklet. Schools participating in NEED's Partnerships in Energy Education program can rent NEED's *Science of Energy* kit for free. The kit contains over 20 energy conversion experiments, a two-hour instructional video, and a teacher's guide with student instructions. All schools can receive the *Science of Energy* Teacher's Guide for free (see the NEED catalog to order the elementary or secondary version). The Teacher's Guide contains several demonstrations that can be done with materials you may already have at school or at home.

You may also want to include additional experiments on heat, motion, light, or electricity that you already do with your students.

Forms of Energy Fun

Time: 1 hour **Grade Level: 5-12**

Appropriate for science classes organized by individual students. Instructions can be found in the *Forms of Energy Fun* booklet. Using their knowledge of the forms of energy and energy conversions, students solve several puzzles relating to the *Science of Energy*.

Step Three: Sources of Energy

Upon completion of this step, students will be able to:

- **List the nation's top ten sources of energy and classify them as renewable or nonrenewable.**
- **Explain how each energy source was formed or is produced, and the historical role of the source.**
- **Locate where sources of energy are found in the nation, and the major uses of each source.**
- **Debate the economic and environmental advantages and disadvantages of each source of energy—today and in the future.**

NOTE: Secure appropriate energy videos, guest speakers, and field trips in advance.

Transparent Energy

Time: 2.5 to 3.5 hours **Grade Level: 7-12**

Appropriate for science or English classes organized by activity groups. Instructions and student handouts are found in the *Transparent Energy* booklet. Ten teams of students use NEED *Energy Fact Sheets* to research different energy sources. Using four transparencies, each team makes a presentation to the class. This activity can be used by a science teacher interested in including writing in the class. When team teaching, the English teacher can conduct this activity (the English teacher should begin this activity two to three days after the science teacher begins the *Science of Energy*).

Energy Chants

Time: 1.5 to 2.5 hours **Grade Level: 5-6**

Appropriate for science classes organized by activity groups. *Energy Chants* instructions can be found in NEED's *Games and Icebreakers* booklet. Students are divided into ten teams, and each team is responsible for a different source of energy. After each team makes a presentation, the class is taught a chant for that energy source. Using the energy chants, the class can be broken into teams for the next activity.

Energy Enigma

Time: 2.5 hours **Grade Level: 7-12**

Appropriate for all classes organized by working groups. Instructions can be found in the *Energy Enigma* booklet. Although this activity has been designed for older students, teachers have found it appropriate for younger students if more time and assistance is given in each step. This activity develops and sharpens students' critical thinking skills as they code and decode clues.

Great Energy Debate Game

Time: 2 hours **Grade Level: 5-12**

Appropriate for science or social studies classes organized by activity groups. Instructions can be found in the *Great Energy Debate Game* booklet. This activity is appropriate for all grade levels. The *Great Energy Debate Game* is designed to explore just six sources of energy, so make sure you use a different activity to cover the other four energy sources. The long version of the *Great Energy Debate Game* does cover all ten energy sources.

Great Energy Rock Performances

Time: 2 to 4 hours **Grade Level: 5-9**

Appropriate for science or English classes organized by activity groups. Instructions can be found in the *Great Energy Rock Performances* booklet. This activity is appropriate for all grade levels. You may choose to do the short or long version *of Great Energy Rock Performances*. In the long version, students write their own song, group introduction, and interview with the host of the show. Students must match the beat and rhyme scheme of the original song (English teachers may be interested in conducting this activity).

In the short version of this activity, students perform a song written by NEED. The use of props, scenery, and costumes will require extra time for students to complete this activity. Usually, only seven sources of energy are used in *Great Energy Rock Performances*. You must cover the other three energy sources in another activity (such as the *Great Energy Debate Game*).

Energy Round-Up

Time: 20 minutes **Grade Level: 5-12**

Appropriate for all classes organized by entire class. Instructions for *Energy Round-Up* can be found in NEED's *Games and Icebreakers* booklet. After being given an energy source, students must find a poster with clues describing their source of energy. *Energy Round-Up* is an excellent way to divide students into groups, while reviewing important information about the sources of energy.

Step Four: Electric Power Generation

Upon completion of this step, students will be able to:

- **Explain what electricity is, and why it's called a secondary form of energy.**
- **Explain the historical events and people responsible for the growth of the electric power industry.**
- **Describe how different sources of energy are used to generate electric power.**
- **Explain the steps used to bring electric power from the power plant to your home.**
- **Discuss the electric power challenges and choices the nation will face in the future.**

NOTE: Secure appropriate energy videos, guest speakers, and field trips in advance.

Static Electricity and Electric Circuits

Your Own Unit(s)—Optional

The activities suggested in Step Four are geared to large power generation systems. You may wish to precede these activities with your own unit on static electricity and electrical circuits.

Electric Connections

Time: 30 minutes **Grade Level: 5-12**

Appropriate for science or math classes organized by working groups. Instructions for *Electric Connections* can be found in NEED's *Games and Icebreakers* booklet. First, students rank the yearly production of electricity for the nation's top ten energy sources. In groups, students rank the top ten sources once again. Finally, students compare their rankings with the actual production figures.

A Current Energy Affair

Time: 2.5 - 3.5 hours **Grade Level: 7-12**

Appropriate for science or English classes organized by seven activity groups. Instructions can be found in the *Current Energy Affair* booklet. Using ten transparencies, the teacher presents an overview of electric power production. Next, each group presents a five minute scene on one aspect of electric power production.

Electric Puzzles

Time: 45 minutes **Grade Level: 4-9**

Appropriate for all classes organized by working groups. Instructions can be found in the *Electric Puzzles* booklet. Using their knowledge of electric power generation and their NEED *Electricity Fact Sheets*, student teams solve several puzzles.

Step Five: Energy Efficiency

Upon completion of this step, students will be able to:

- **Explain the term energy efficiency, and how increased efficiency has reduced the nation's need for energy.**
- **Explain and practice energy efficient behaviors at home, school, and in transportation.**
- **Debate and discuss the economic, environmental, and social impacts of certain energy efficiency policies and actions.**

NOTE: Secure appropriate energy videos, guest speakers, and field trips in advance.

This Week in Energy Conservation

Time: 1.5 to 2.5 hours **Grade Level: 5-12**

Appropriate for science or English classes organized by activity groups. Instructions for *This Week in Energy Conservation* can be found in NEED's *Games and Icebreakers* booklet. After reading the anchorperson's lead, each group writes and performs a television segment on a specific area of energy efficiency.

Energy Conservation Contract

Time: 1.5 to 2.5 hours **Grade Level: 4-9**

Appropriate for science, math, or social studies classes organized by individual students. Instructions can be found in the *Energy Conservation Contract* booklet. Each student surveys his/her family's energy behaviors. After several weeks, students survey their families once again and tabulate their energy savings.

Most Wanted Energy Wasters

Time: 1 to 1.5 hours **Grade Level: 5-9**

Appropriate for science or English classes organized by individual students. Instructions for *Most Wanted Energy Wasters* can be found in NEED's *Games and Icebreakers* booklet. Students identify several of their energy wasting behaviors. Next, students develop a "wanted poster" based on these behaviors.

Conservation for Our Nation

Time: 30 to 40 minutes **Grade Level: 4-12**

Appropriate for all classes organized into groups of 8-10 students. Instructions for *Conservation for our Nation* can be found in NEED's *Games and Icebreakers* booklet. Students snap, clap, and slap as they give energy conservation tips. This activity reinforces all the ways energy can be saved at home, school, and in transportation.

Step Six: Synthesis and Reinforcement

Synthesis Activities

NEED Songs

Time: 10 to 30 minutes **Grade Level: 5-9**

Appropriate for all classes organized by entire class. Energy conservation songs can be found in the NEED Song Book. "What You Gonna Do With an Energy Waster," "Savin' Energy," and "Oh Dear What Can the Matter Be," are a great way to reinforce the energy efficiency message.

Energy Math Challenge

Time: 1.5 to 2.0 hours **Grade Level: 5-9**

Appropriate for science or math classes organized by working groups. Instructions can be found in the *Energy Math Challenge* booklet. Students work as individuals and in teams to solve energy math problems. The same basic problems are repeated in each of the three rounds. The Mega-question is an open ended math problem—students use their math skills to make predictions or judgments.

Museum of Solid Waste and Energy

Time: 4 to 6 hours **Grade Level: 5-12**

Appropriate for science or English classes organized by activity groups. Instructions can be found in the *Museum of Solid Waste and Energy* booklet. Each team is given an exhibit topic, a student guide, and background information. The museum "curators" complete eight exhibits and invite students, teachers, and community members to take a guided tour. A pre/post museum survey measures the knowledge and opinions of museum curators and visitors. To receive your survey results, return the museum scanning cards to NEED.

Yesterday in Energy

Time: 1 to 4 hours **Grade Level: 5-9**

Appropriate for science, social studies or English classes organized by entire class. Instructions can be found in the *Yesterday in Energy* booklet. In the short version of this activity, senior citizens, or students playing senior citizens, discuss life in the "olden days." In the long version, six student groups prepare exhibits and presentations on different aspects of energy use, i.e., transportation, communications, etc.

Energy Around the World

Time: 1.5 to 2.5 hours **Grade Level: 5-9**

Appropriate for science or social studies classes organized by activity groups. Instructions can be found in the *Energy Around the World* booklet. Each student team is assigned a continent and each student is given basic energy information about one of 40 countries. Students further research their country and make a presentation to the class.

Marine Energy

Time: 1 to 4 hours **Grade Level: 7-12**

Appropriate for science or social studies classes organized by activity groups. Instructions can be found in the *Marine Energy* booklet. Students conduct a community hearing on the development of energy and/or minerals in coastal areas. If time is limited, you may choose to have students discuss the issue of developing marine resources in coastal areas.

Let's Talk Energy Show

Time: 1 to 5 hours **Grade Level: 7-12**

Appropriate for science or social studies classes organized by activity groups. Instructions can be found in the *Let's Talk Energy* booklet. Students or energy experts serve as the host and guests for this TV style talk show/public affairs show. Pre/post audience surveys measure students' increase in knowledge and change in attitudes. If you use adult experts, secure them far enough in advance and send them the host's script and audience survey. If you use students as the "experts," make sure they research their topics thoroughly in advance.

NEED Energy Plays

Time: 1 to 5 hours **Grade Level: 5-12**

Appropriate for science or English classes organized by activity groups. *Energy Blockbusters*, *Animated Energy*, *Classic Energy TV*, and *Incredible Energy Tales* each contain five to six scenes covering different energy sources. The plays come with Energy Entertainment Guides (audience members answer five questions for each scene). Students can read the plays in class, or they can perform the plays for fellow students, teachers, and parents. See the NEED '96 Catalog for more information about the plays.

Senate Energy Hearings

Time: 1 to 5 Hours **Grade Level: 7-12**

Appropriate for science or social studies classes organized by activity groups. Instructions for the *Senate Energy Hearings* can be found in the NEED *Project Activities* booklet. Students, playing U.S. Senators from different states, conduct a hearing on an energy issue. Actual experts or student "experts" testify before the committee. You can choose a topic from the *Let's Talk Energy Show* booklet, or a topic of local concern, for the hearings.

Energy Past and Present

Time: 1.5 to 2.5 hours **Grade Level: 5-12**

Appropriate for science or English classes organized by working groups. Instructions for *Energy Past and Present* can be found in the NEED *Project Activities* booklet. Students interview senior citizens and prepare a publication on what life was like in the past.

Energy Time Capsule

Time: 1.5 to 3.0 hours **Grade Level: 5-12**

Appropriate for science or social studies classes organized by working groups. Instructions for the *Energy Time Capsule* can be found in the NEED *Project Activities* booklet. Each team is given a different topic. Students place items in a time capsule representing present energy use. Students also predict how energy will be used 25, 50, or 100 years into the future.

Energy Tip Hot Line

Time: 1 to 2 hours **Grade Level: 5-9**

Appropriate for science or English classes organized by working groups. Instructions for the *Energy Tip Hot Line* can be found in the NEED *Project Activities* booklet. Students write to VIPs, inviting them to participate in the *Energy Tip Hot Line*. Next, students write energy tips and record them on a telephone answering machine.

Energy Placemats

Time: 1 to 1.5 hours **Grade Level: 5-8**

Appropriate for science classes organized by working groups. Instructions for *Energy Placemats* can be found in the NEED *Project Activities* booklet. Students design and produce educational placemats to be used at home or in area restaurants.

The Energy Times

Time: 2 to 4 hours **Grade Level: 5-12**

Appropriate for science or English classes organized by activity groups. Instructions for *The Energy Times* can be found in the NEED *Project Activities* booklet. News stories, features, and energy horoscopes are just a few of the articles students develop for this publication.

Adopt A Class

Time: 1.5 to 3.0 hours **Grade Level: 5-12**

Appropriate for all classes organized by working groups. Instructions for *Adopt A Class* can be found in the NEED *Project Activities* booklet. Students develop an activity, or select a NEED activity, appropriate for younger students. This activity is a great way to get younger students enthusiastic about energy.

Energize Your Local DJ

Time: 1.5 to 2.5 hours **Grade Level: 5-12**

Appropriate for science or English classes organized by working groups. Instructions for *Energize Your Local DJ* can be found in the NEED *Project Activities* booklet. Students prepare public service announcements, energy trivia, and contests to be used by local radio stations.

Reach Out and Teach Someone

Time: Varies **Grade Level: 5-12**

Appropriate for all classes organized by entire class. Instructions can be found in the *Reach Out and Teach Someone* booklet. Students participate in community outreach projects designed to increase energy awareness or institute energy conservation programs.

Reinforcement Activities

Energy Carnival—Seven Working Groups

Time: 1 to 2 hours **Grade Level: 5-12**

Appropriate for all classes organized by working groups. Instructions can be found in the *Energy Carnival* booklet. The *Energy Carnival* is NEED's most popular activity. Working Groups try to win Energy Bucks as they visit seven to ten carnival stations. Students combine carnival skills, such as knocking over cans in Renewable/Nonrenewable Knockdown, with math, spelling, history, and science knowledge. A wide range of students can participate in the *Energy Carnival*—each game has questions or problems suitable for all age levels.

Energy Jeopardy

Time: 1.5 hours **Grade Level: 5-12**

Appropriate for all classes organized by working groups. Instructions can be found in the *Energy Jeopardy* booklet. Students work in teams to provide questions for the answers in various categories. Each Working Group is assigned to one of seven Double Energy Jeopardy categories. Students select the answers and dollar amounts for their assigned categories. This selection process is a good critical thinking exercise. Each *Energy Jeopardy* category contains ten answers, ranging in difficulty. *Energy Jeopardy* is appropriate for students in grades five through 12.

Energy Eliminators

Time: 20 minutes **Grade Level: 5-12**

Appropriate for all classes organized by working groups. Instructions for *Energy Eliminators* can be found in NEED's *Games and Icebreakers* booklet. Student teams brainstorm words and phrases relating to a particular energy source. After two minutes, the students eliminate the words and phrases they brainstormed from the official game list. The students reveal the remaining words and phrases to the other groups, who try to guess the identity of the team.

Energy Match Game

Time: 20 minutes **Grade Level: 5-12**

Appropriate for all classes organized by working groups. Instructions for the *Energy Match Game* can be found in NEED's *Games and Icebreakers and Games* booklet. Students must rely on their knowledge of energy to match answers with the other members of their team.

Energy Squares

Time: 20 minutes **Grade Level: 5-12**

Appropriate for all classes organized by entire class. Instructions for *Energy Squares* can be found in NEED's *Games and Icebreakers* booklet. Based on *Hollywood Squares*, students must agree or disagree with the celebrity guests' answers to energy questions to get an "X" or "O."

Energy Source Relay Race

Time: 20 minutes **Grade Level: 5-12**

Appropriate for all classes organized by working groups. Instructions for the *Energy Source Relay Race* can be found in NEED's *Games and Icebreakers* booklet. Based on *Pictionary*, students draw pictures to help team members guess a source of energy.

Energy Bumper Stumpers

Time: 15 minutes **Grade Level: 5-12**

Appropriate for all classes organized by working groups. Instructions for *Energy Bumper Stumpers* can be found in NEED's *Games and Icebreakers* booklet. Forty different license plate stumpers are provided, enabling a wide range of grade levels to play this game.

Energy Name Game

Time: 20 minutes **Grade Level: 5-12**

Appropriate for all classes organized by activity groups. Instructions for the *Energy Name Game* can be found in NEED's *Games and Icebreakers* booklet. Each student chooses an energy related last name that begins with the same letter as his/her first name. Next, students sit in a circle and repeat the energy names of the students preceding them.

Energy Bingo

Time: 30 minutes **Grade Level: 5-12**

Appropriate for all classes organized by entire class. Instructions for *Energy Bingo* can be found in NEED's *Games and Icebreakers* booklet. Students must find 16 different people to answer the 16 questions on their *Energy Bingo* sheet. This activity is a great icebreaker.

Step Seven: Evaluation

Evaluation is an important component of your energy unit, and should be ongoing. As mentioned in Step One, your students should participate in the NEED *Energy Education Poll* prior to beginning the unit. The *Energy Education Rating* (EER) *Guide* (page 24) is another valuable evaluation tool. Although you will never see the students' EER responses, the guide will help students measure their growth in energy knowledge.

A Student Evaluation Form (page 22) will assist you and your students to evaluate individual activities and the learning strategies suggested in this Blueprint. Students should complete the first section of the evaluation at the beginning of the unit. Individual activities should be evaluated as they are completed. The third section of the Student Evaluation Sheet should be completed at the end of the unit.

Many NEED activities contain suggestions for how to evaluate students' performance. In most activities, all group members receive the same grade for their project or presentation. Please feel free to modify these evaluation suggestions as necessary.

Working Group Study Meeting

To prepare for the Unit Exam, students meet in working groups to review energy information covered during the unit. Give the working groups approximately 60 minutes to review this information. During the meeting, students should lead the group when their specialty areas are discussed.

Unit Exam

You may choose to use the 62 multiple choice questions found on page 31 as a unit exam. The questions are divided into five categories (Science of Energy, Consumption/Conservation, Fossil Fuels, Renewables, and Electric Power). The first few questions in each category are the easiest—the questions increase in difficulty as you proceed in the category. Choose questions that match what was taught during the unit.

Students can complete the multiple choice questions individually or in their Working Groups. The answers can be found on page four.

Instead of, or in addition to, the multiple choice questions, you may decide to have students complete several essay questions. Six sample essay questions can be found on page 35. Students can answer the essay questions individually or in their Working Groups.

Providing Feedback to NEED

We'd like to hear your comments and suggestions about this energy education unit. Please let us know what worked well and what needs improvement. Send your compliments and complaints to the NEED Project, P.O. Box 2518, Reston, VA 22090, or call (800) 875-5029. Also, let us know if you've developed a new activity—we may include it in next year's materials.

Sample Energy Units

Elementary—Basic Unit

Step I
1. Preparation
2. Energy Education Poll (pre-survey)

Step II
1. Elementary Science of Energy
2. Forms of Energy Fun

Step III
1. Energy Chants
2. Great Energy Rock Performances or NEED play
3. Great Energy Debate Game

Step IV
1. Electric Connections
2. Electric Puzzles

Step V
1. This Week in Energy Conservation

Step VI
1. Energy Math Challenge (middle school level)
2. Yesterday in Energy (short version)
3. Energy Jeopardy or Energy Carnival

Step VII
1. Energy Education Poll (post-survey)
2. Unit Exam

Elementary—Comprehensive Unit

Step I
1. Preparation
2. Energy Education Poll (pre-survey)

Step II
1. Elementary Science of Energy
2. Forms of Energy Fun

Step III
1. Energy Chants
2. Great Energy Rock Performances
3. NEED play
4. Great Energy Debate Game

Step IV
1. Electric Connections
2. Current Energy Affair
3. Electric Puzzles

Step V
1. This Week in Energy Conservation
2. Energy Conservation Contract
3. NEED Songs
4. Most Wanted Energy Wasters

Step VI
1. Museum of Solid Waste and Energy
2. Yesterday in Energy
3. Energy Around the World
4. Energy Math Challenge (middle school level)
5. Energy Jeopardy
6. Energy Carnival

Step VII
1. Energy Education Poll (post-survey)
2. Unit Exam

Elementary—Outreach Unit

Step I - VII
1. Basic or Comprehensive classroom unit

Outreach
1. Conduct play, rock performances, or museum for other classes
2. Energy Time Capsule
3. Energy Tip Hot Line
4. Energy Placemats
5. The Energy Times
6. Adopt a Class
7. Energize Your Local DJ

Elementary Energy Day (Optional Format)

1. Energy Bingo
2. Energy Chants
3. Great Energy Rock Performances
4. Energy Math Challenge (middle school level)
5. Yesterday in Energy (short version)
6. Conservation for our Nation
7. Energy Jeopardy

Intermediate—Basic Unit

Step I
1. Preparation
2. Energy Education Poll (pre-survey)

Step II
1. Secondary Science of Energy
2. Forms of Energy Fun

Step III
1. Transparent Energy (using scripts)
2. Great Energy Debate Game

Step IV
1. Electric Connections
2. Current Energy Affair
3. Electric Puzzles

Step V
1. This Week in Energy Conservation

Step VI
1. Energy Math Challenge (junior high school level)
2. Energy Jeopardy

Step VII
1. Energy Education Poll (post-survey)
2. Unit Exam

Sample Energy Units

Intermediate—Comprehensive Unit

Step I
1. Preparation
21. Energy Education Poll (pre-survey)

Step II
1. Secondary Science of Energy
2. Forms of Energy Fun

Step III
1. Transparent Energy (writing scripts)
2. Great Energy Rock Performances
3. Great Energy Debate Game
4. Energy Enigma

Step IV
1. Electric Connections
2. Current Energy Affair
3. Electric Puzzles

Step V
1. Museum of Solid Waste and Energy
2. This Week in Energy Conservation
3. Energy Conservation Contract

Step VI
1. Energy Math Challenge (junior high school level)
2. Yesterday in Energy (create museum)
3. Energy Around the World
4. Energy Jeopardy
5. Energy Carnival

Step VII
1. Energy Education Poll (post-survey)
2. Unit Exam

Intermediate—Outreach Unit

Step I - VII
1. Basic or Comprehensive classroom unit

Outreach
1. Conduct activities for other classes
2. Reach Out and Teach Someone
3. Adopt a Class
4. Energize Your Local DJ
5. Energy Tip Hot Line
6. The Energy Times

Secondary—Outreach Unit

Step I - VII
1. Basic or Comprehensive classroom unit

Outreach
1. Reach Out and Teach Someone
2. Project Activities
3. Adopt a Class

Secondary—Basic Unit

Step I
1. Preparation
2. Energy Education Poll (pre-survey)

Step II
1. Secondary Science of Energy

Step III
1. Transparent Energy
2. Energy Enigma

Step IV
1. Electric Connections
2. Current Energy Affair

Step V
1. This Week in Energy Conservation

Step VI
1. Energy Jeopardy

Step VII
1. Energy Education Poll (post-survey)
2. Unit Exam

Secondary—Comprehensive Unit

Step I
1. Preparation
2. Energy Education Poll (pre-survey)

Step II
1. Secondary Science of Energy
2. Forms of Energy Fun

Step III
1. Transparent Energy (writing scripts)
2. Great Energy Debate Game
3. Energy Enigma

Step IV
1. Electric Connections
2. Current Energy Affair

Step V
1. This Week in Energy Conservation
2. Energy Conservation Contract

Step VI
1. Energy Around the World
2. Marine Energy
3. Senate Energy Hearings
4. Energy Jeopardy
5. Let's Talk Energy Show

Step VII
1. Energy Education Poll (post-survey)
2. Unit Exam

NEED Assignment Sheet

Student Name:_____

Section I

Working Group:

[ ] Chemicals [ ] Electricals [ ] Kinetics [ ] Nuclears [ ] Potentials [ ] Thermals [ ] Radiants

Working Group Activities:

[ ] Science of Energy
[ ] Electric Puzzles
[ ] Energy Time Capsule
[ ] Adopt A Class
[ ] Energy Jeopardy
[ ] Energy Source Relay Race
[ ] Energy Enigma
[ ] Energy Math Challenge
[ ] Energy Tip Hot Line
[ ] Energize Your Local DJ
[ ] Energy Eliminators
[ ] Energy Bumper Stumpers
[ ] Electric Connections
[ ] Energy Past and Present
[ ] Energy Placemats
[ ] Energy Carnival
[ ] Energy Match Game

Section II

Activity Groups:

[ ] Transparent Energy (*Petroleum, Natural Gas, Coal, Uranium, Propane, Hydropower, Biomass, Geothermal, Wind, Solar*)

[ ] Energy Chants (*Petroleum, Natural Gas, Coal, Uranium, Propane, Hydropower, Biomass, Geothermal, Wind, Solar*)

[ ] Great Energy Debate Game (*Petroleum, Natural Gas, Coal, Uranium, Hydropower, Biomass*)

[ ] Rock Performances (*Petroleum, Natural Gas, Coal, Uranium, Propane, Hydropower, Biomass, Geothermal, Wind, Solar*)

[ ] A Current Energy Affair (*History, Generation, Dependability, Management, Energy Loss, Cogeneration, Future*)

[ ] This Week in Energy Conservation (*Home Heating, Hot Water, Lighting, Cooking, Driving Habits, Auto Maintenance*)

[ ] Yesterday in Energy (*Transportation, Heating/Cooling/Lighting, Entertainment, Communication, In the Home, On the Job*)

[ ] Energy Around The World (*Country:*_____)

[ ] Let's Talk Energy Show (*Solid Waste, Alternative Fuels, Petroleum Supply and Demand, Electricity Supply and Demand*)

[ ] Museum of Solid Waste and Energy (*Station 1, Station 2, Station 3, Station 4, Station 5, Station 6, Station 7, Station 8*)

[ ] NEED Energy Plays
[ ] The Energy Times
[ ] Marine Energy
[ ] Energy Name Game
[ ] Senate Energy Hearings

Section III

Class or Individual Activities:

[ ] Energy Round-up
[ ] Conservation For Our Nation
[ ] Reach Out and Teach Someone
[ ] Energy Conservation Contract
[ ] NEED Songs
[ ] Energy Squares
[ ] Most Wanted Energy Wasters
[ ] Forms of Energy Fun
[ ] Energy Bingo

Specialty Areas:

[ ] Petroleum [ ] Natural Gas [ ] Coal [ ] Uranium [ ] Propane
[ ] Hydropower [ ] Biomass [ ] Geothermal [ ] Wind [ ] Solar
[ ] Introduction [ ] Electricity

Student Tracking Form

Working Groups

Chemicals	Electricals	Kinetics	Nuclears	Potentials	Thermals	Radiants
1._____	1._____	1._____	1._____	1._____	1._____	1._____
2._____	2._____	2._____	2._____	2._____	2._____	2._____
3._____	3._____	3._____	3._____	3._____	3._____	3._____
4._____	4._____	4._____	4._____	4._____	4._____	4._____
5._____	5._____	5._____	5._____	5._____	5._____	5._____

Activities Chosen

Working Groups: _____

_____

Activity Groups: _____

_____

Class and Individual: _____

_____

Activity Groups

Name of Activity: _____

Group_____	Group_____	Group_____	Group_____	Group_____
1._____	1._____	1._____	1._____	1._____
2._____	2._____	2._____	2._____	2._____
3._____	3._____	3._____	3._____	3._____
4._____	4._____	4._____	4._____	4._____
5._____	5._____	5._____	5._____	5._____

Group_____	Group_____	Group_____	Group_____	Group_____
1._____	1._____	1._____	1._____	1._____
2._____	2._____	2._____	2._____	2._____
3._____	3._____	3._____	3._____	3._____
4._____	4._____	4._____	4._____	4._____
5._____	5._____	5._____	5._____	5._____

Group Contract

Directions: ***One member of your group should read the section below aloud as the other members of the group follow along.***

Team Spirit

When a football team wins a championship, or a producer's movie wins an award, or a medical team makes a great scientific discovery, the spokesperson for the group thanks all the people involved in the effort.

In the case of a winning Super Bowl team, the coach gives credit for the victory to his assistant coaches, the football players, the scouts, the owner, and the fans. At the Academy Awards, the producer of the best picture thanks the writers, the actors, the cinematographers, and the many others who made the film a success. And when you hear about a medical team that's developed a new artificial limb or organ, or found the cure for a disease, credit goes to the doctors, the biologists, the technicians, and the support staff.

In all these cases, a group of people, each with different skills and abilities, worked together for a common goal. When they achieved their goal, the members of these groups felt proud to be a team member. Most leading actors and star athletes will tell you that the team spirit and accomplishments were sweeter to them than the individual praise they received for their performances.

Your Contract

The purpose of this Group Contract is to have the members of our group discuss the importance of team work, and to make a commitment to do their best on our energy project. A weak member of the group can cancel out the outstanding efforts of the others.

Let's take five minutes to discuss unsuccessful group experiences you may have had as a member of a softball team, a Girl Scout troop, a band, or the like. What did it feel like to be part of an unsuccessful team? What made the team unsuccessful? Develop an eight to ten item list and be ready to hand it in to the teacher at the end of this assignment.

Now let's take another five minutes to discuss successful group experiences that you may have had. What did it feel like to be part of a winning team? What made the team so successful? Develop an eight to ten item list and be ready to hand it in to the teacher at the end of this assignment.

Our group should now discuss what each of us must do to make our energy education project one of the best ever created by a group of students. As we set our goals, keep in mind that, in many cases, our project can be submitted for state and national awards. Now let's write a contract that we all can agree on. A typical group contract might be written as shown below.

We, the members of the (name of project) agree to:

- get our work in on time;
- give 100 percent effort;
- rehearse parts at home;
- give the proper amount of time to each task;
- not be a disruptive force during group meetings and work time;
- give criticism in a positive way.

Once your group has written its contract, all the members must sign it. Then give the completed contract to your teacher along with your group's two lists.

Student Evaluation Form

Please take out a separate sheet of paper and write your name and working group name at the top. Using this sheet of paper, answer the following questions concerning the NEED energy education unit. The NEED Project wants to know your thoughts about participating in the unit. NEED will use your comments and suggestions to revise the unit for next year's program.

Section One—What are your thoughts as you begin this energy unit?

1. How interested are you in learning about energy?
2. How do you feel about working in groups for most of the energy unit? Do you think you'll learn more by working in a group?
3. How well do you think your group will function as a team?
4. Do you welcome the opportunity to become an energy specialist in three areas?
5. How did you feel about giving yourself an Energy Education Rating?

Section Two—Evaluation of Activities

1. Did you enjoy and learn from the energy unit's games and activities? Which activities did you feel were most beneficial? Which activities did you feel were least beneficial?
2. How effective was your working group meeting?
3. Were you well prepared to answer the Energy Unit Exam questions by yourself?
4. How effective was answering the Energy Unit Exam questions as a group? Did you learn from others as the group discussed each question?

Section Three—What are your thoughts as you finish this energy unit?

1. Has your interest in energy increased as a result of this unit? Why or why not?
2. What did you think about working in groups for most of the energy unit? Did you learn more about energy by working in groups?
3. Did your group work well together to complete tasks and activities?
4. Did you enjoy the opportunity of being an energy specialist in three areas for your group?
5. What do you think about the nation's energy future?
6. What do you think you can and will do to make the nation's energy future a better one?

Teacher Evaluation Form

On a separate sheet of paper, please write your name, school name, telephone number, and best hours to reach you at the top. Using this sheet of paper, answer the following questions concerning the NEED energy education unit. The NEED Project wants to know your thoughts about conducting the unit. NEED will use your comments and suggestions to revise the unit for next year's program.

1. How useful was this guide in helping you prepare and organize your energy unit?
2. What were your students' responses to the Section One questions of the Student Evaluation Form? What were your thoughts about these items prior to the start of the unit?
3. What were your students' responses to the Section Two questions of the Student Evaluation Form? What comments do you have for the activities you chose for the energy unit?
4. What were your students' responses to the Section Three questions of the Student Evaluation Form? What are your thoughts and comments about these questions?
5. Did this energy unit prompt you to use new or different teaching styles, or help you develop existing ones?
6. Please comment on the following materials and services: Energy Fact Sheets, U.S. Energy Geography, Energy Education Poll, *Energy Exchange* magazine, and the Youth Awards Program for Energy Achievement. Did you receive all the materials and services you ordered from the NEED catalog? Did you receive these materials on time?

If you attended a NEED Leadership Training Workshop, please answer the following questions:

1. Did the NEED Leadership Training Workshop help you with the implementation of your unit?
2. What role did the students trained at the NEED workshop play in conducting the energy unit in your classes?

Secondary Energy Education Rating Guide

Listed on the next few pages are 13 categories representing ten energy sources plus electricity, introduction to energy, and the forms of energy. Under each heading are numerous words and phrases relating to that topic. To test your energy education rating and classify yourself as either energy ignorant, energy literate, energy educated, or an energy expert, simply start with the first category and look at the words. A simple definition is not sufficient knowledge, you must feel that you honestly understand various aspects of the word or phrase. It is not necessary for you to be an expert about every term to still consider yourself very well informed about the topic. You grade yourself and you are the judge deciding whether you know a little or a lot, so don't cheat yourself. The following is an example using the words photovoltaic cell:

Energy Ignorant—knows absolutely nothing about a photovoltaic cell.

Energy Literate—knows that a photovoltaic cell makes electricity from sunlight and is often found in calculators or toys.

Energy Educated—knows the above, plus that a photovoltaic cell works best when hit by the sun at a 90 degree angle. Also knows that electricity produced this way costs more than electricity produced through conventional methods, and the fact that only 10 percent of the sunlight hitting the cell is actually changed to electricity.

Energy Expert—knows all of the above, in addition to the science behind how the cell works, and current technologies being used.

As you begin to test your energy education rating, remember you are judging yourself. If you don't know a word or phrase, go ask someone or do a little research. NEED's Energy Fact Sheets are an excellent resource for this activity. Next to each phrase you can mark yourself EI for Energy Ignorant, EL for Energy Literate, EE for Energy Educated, or EX for Energy Expert. After reviewing all the words and phrases under a topic, give yourself an overall rating for that topic. This will help you keep track of your progress and aid in evaluating your total energy education rating at the end.

Petroleum

Before		After
_____	Formation	_____
_____	History	_____
_____	Exploratory and "Dry" Wells	_____
_____	Derrick	_____
_____	Top Producers— US and world	_____
_____	Oil Refining	_____
_____	Shipping Petroleum Products	_____
_____	Distributing	_____
_____	Demand	_____
_____	Imported Oil	_____
_____	OPEC	_____
_____	Strategic Petroleum Reserve	_____
_____	Arctic National Wildlife Refuge	_____
_____	Outer Continental Shelf	_____
_____	Prices	_____
_____	Environmental Effects	_____

Nuclear Energy

Before		After
_____	Formation	_____
_____	Fusion	_____
_____	Fission	_____
_____	Chain Reaction	_____
_____	History	_____
_____	Nuclear Fuel Cycle:	_____
_____	*Mining*	_____
_____	*Milling*	_____
_____	*Conversion*	_____
_____	*Enrichment*	_____
_____	*Fuel Fabrication*	_____
_____	Nuclear Reactor	_____
_____	Spent Fuel Storage	_____
_____	Reprocessing	_____
_____	Nuclear Waste Policy Act	_____
_____	Yucca Mountain	_____
_____	Radiation and Millirem	_____
_____	Economics	_____
_____	Environmental Effects	_____
_____	Three Mile Island and Chernobyl	_____

Geothermal Energy

Before		After
_____	Formation	_____
_____	Radioactive Decay	_____
_____	Core, Mantle, and Crust	_____
_____	History	_____
_____	Magma	_____
_____	Plate Tectonics and Boundaries	_____
_____	"Ring of Fire"	_____
_____	Hydrothermal	_____
_____	Geopressured	_____
_____	Hot Dry Rock	_____
_____	Resources and Reserves	_____
_____	Uses	_____
_____	Installed Capacity	_____
_____	Direct Heating	_____
_____	Construction Costs	_____
_____	Environmental Effects	_____

Natural Gas

Before		After
_____	Formation	_____
_____	Chemical Properties and Structure	_____
_____	History	_____
_____	Exploration and Development	_____
_____	Transmission and Distribution	_____
_____	Cf, Mcf, Tcf, Therms, Btu's.	_____
_____	Geographic areas of production	_____
_____	Storage	_____
_____	Uses	_____
_____	Reserves	_____
_____	Prices	_____
_____	Environmental Effects	_____

Biomass

Before		After
_____	Formation	_____
_____	Wood and Agricultural Products	_____
_____	Burning	_____
_____	Solid Waste	_____
_____	Bacterial Decay	_____
_____	Methane and Landfill Gas	_____
_____	Fermentation	_____
_____	Ethanol and Gasohol	_____
_____	Energy Content	_____
_____	Environmental Effects	_____

Coal

Before		After
_____	Formation	_____
_____	History	_____
_____	Surface Mines	_____
_____	Underground Mines	_____
_____	Types of Coal	_____
_____	Processing	_____
_____	Transporting	_____
_____	Production	_____
_____	Uses	_____
_____	Clean Coal Technologies	_____
_____	Environmental Effects	_____

Propane

Before		After
_____	Formation	_____
_____	Chemical Properties and Structure	_____
_____	Liquid Propane	_____
_____	History	_____
_____	Production	_____
_____	Transportation and Distribution	_____
_____	Uses	_____
_____	Imports—From where?	_____
_____	Transportation Fuel	_____
_____	Environmental Effects	_____

Solar Energy

Before		After
_____	Fusion	_____
_____	Solar Radiation	_____
_____	History	_____
_____	Space and Water Heating	_____
_____	Solar Collector	_____
_____	Active and Passive Solar Homes	_____
_____	Heat Storage	_____
_____	Hot Water	_____
_____	Photovoltaics	_____
_____	Thermal Power Electricity	_____
_____	Environmental Effects	_____

Introduction to Energy

Before		After
_____	Btu, Quad	_____
_____	Energy Supply and Demand	_____
_____	Renewable	_____
_____	Nonrenewable	_____
_____	Residential and Commercial Sector	_____
_____	Industrial Sector	_____
_____	Transportation Sector	_____
_____	Energy Efficiency	_____

Wind

Before		After
_____	Formation	_____
_____	History	_____
_____	Wind Machines	_____
_____	Farms	_____
_____	Geographical Areas of Production	_____
_____	Seasonal Variations	_____
_____	Economics	_____
_____	Resources	_____
_____	Production Capacity	_____
_____	Environmental Effects	_____

Electricity

Before		After
_____	Generator	_____
_____	Turbine	_____
_____	Transformer	_____
_____	Primary Energy Sources	_____
_____	Reliability	_____
_____	Capacity	_____
_____	Peak and Base-load	_____
_____	Power Pools	_____
_____	Demand-Side Management	
_____	Kilowatt-hour	_____
_____	Kilowatt, Megawatt, and Gigawatt	_____
_____	Alessandro Volta	_____
_____	Edison	_____
_____	Faraday	_____
_____	Pearl Street Power Station	_____
_____	Niagara Falls	_____
_____	Energy Guide Labels	_____
_____	National Appliance Energy Conservation Act	_____
_____	Economics	_____
_____	Energy Efficiency	_____
_____	Transmission Losses	_____
_____	Public Utility Regulatory Policy Act	_____
_____	Independent Power Producers	_____
_____	Cogeneration	_____
_____	Superconductivity	_____
_____	Fusion Energy	_____
_____	Environmental Effects	_____

Forms of Energy

Before		After
_____	Chemical	_____
_____	Radiant	_____
_____	Nuclear	_____
_____	Thermal	_____
_____	Electrical	_____
_____	Mechanical	_____
_____	Activation Energy	_____

Hydropower

Before		After
_____	Formation	_____
_____	Water Cycle	_____
_____	History	_____
_____	Dam	_____
_____	Reservoir	_____
_____	Penstock	_____
_____	Turbine	_____
_____	Generator	_____
_____	Trash Racks	_____
_____	Spillway Gates	_____
_____	Head and Flow	_____
_____	Flood Control	_____
_____	Pumped Storage System	_____
_____	Hydropower Production	_____
_____	Baseload Power	_____
_____	Tidal Power	_____
_____	Wave Power	_____
_____	Economics	_____
_____	Environmental Effects	_____

Topic	Rating	
	Before	After
Petroleum	_____	_____
Nuclear Energy	_____	_____
Forms of Energy	_____	_____
Propane	_____	_____
Natural Gas	_____	_____
Hydropower	_____	_____
Geothermal Energy	_____	_____
Coal	_____	_____
Solar Energy	_____	_____
Wind	_____	_____
Electricity	_____	_____
Introduction to Energy	_____	_____
Biomass	_____	_____
Your Total Rating	_____	

Elementary Energy Education Rating Guide

Listed below and on the next few pages are 13 categories representing ten energy sources plus electricity, introduction to energy, and the forms of energy. Under each heading are numerous words and phrases relating to that topic. To test your energy education rating and classify yourself as either energy ignorant, energy literate, energy educated, or an energy expert, simply start with the first category and look at the words. A simple definition is not sufficient knowledge, you must feel that you honestly understand various aspects of the word or phrase. It is not necessary for you to be an expert about every term to still consider yourself very well informed about the topic. You grade yourself and you are the judge deciding whether you know a little or a lot, so don't cheat yourself. The following is an example using the words photovoltaic cell:

Energy Ignorant—knows absolutely nothing about a photovoltaic cell.

Energy Literate—knows that a photovoltaic cell makes electricity from sunlight and is often found in calculators or toys.

Energy Educated—knows the above, plus that a photovoltaic cell works best when hit by the sun at a 90 degree angle. Also knows that electricity produced this way costs more than electricity produced through conventional methods.

Energy Expert—knows all of the above, in addition to the fact that only one-tenth of the sunlight hitting the cell is actually changed to electricity.

As you begin to test your energy education rating, remember you are judging yourself. If you don't know a word or phrase, go ask someone or do a little research. NEED's Energy Fact Sheets are an excellent resource for this activity. You will be rating your energy knowledge twice (before the energy unit begins and after the unit is finished). Use the blanks to the left of the phrases for your *before* ratings and the blanks to the right of the phrases for your *after* ratings. Mark EI for Energy Ignorant, EL for Energy Literate, EE for Energy Educated, or EX for Energy Expert. After reviewing all the words and phrases under a topic, give yourself an overall rating for that topic. This will help you keep track of your progress and aid in evaluating your total energy education rating at the end.

Nuclear Energy

Before		After
_____	Formation	_____
_____	Fusion	_____
_____	Fission	_____
_____	Chain Reaction	_____
_____	History	_____
_____	Nuclear Reactor	_____
_____	Nuclear Waste	_____
_____	Radiation	_____
_____	Environmental Effects	_____

Coal

Before		After
_____	Formation	_____
_____	History	_____
_____	Surface Mines	_____
_____	Underground Mines	_____
_____	Processing	_____
_____	Transporting	_____
_____	Production	_____
_____	Uses	_____
_____	Environmental Effects	_____

Forms of Energy

Before		After
_____	Chemical	_____
_____	Radiant	_____
_____	Nuclear	_____
_____	Thermal	_____
_____	Electrical	_____
_____	Mechanical	_____
_____	Activation Energy	_____

Geothermal Energy

Before		After
_____	Core, Mantle, and Crust	_____
_____	History	_____
_____	Location of Sources	_____
_____	Uses	_____
_____	Direct Heating	_____
_____	Generating Electricity	_____
_____	Environmental Effects	_____

Propane

Before		After
_____	Chemical Properties	_____
_____	Liquid Propane	_____
_____	History	_____
_____	Production	_____
_____	Distribution	_____
_____	Uses	_____
_____	Transportation Fuel	_____
_____	Environmental Effects	_____

Natural Gas

Before		After
_____	Formation	_____
_____	Chemical Properties	_____
_____	History	_____
_____	Production	_____
_____	Transporting and Storing	_____
_____	Uses	_____
_____	Environmental Effects	_____

Wind

Before		After
_____	Formation	_____
_____	History	_____
_____	Wind Machines	_____
_____	Farms	_____
_____	Areas of Production	_____
_____	Seasonal Variations	_____
_____	Economics	_____
_____	Resources	_____
_____	Production Capacity	_____
_____	Environmental Effects	_____

Hydropower

Before		After
_____	Water Cycle	_____
_____	History	_____
_____	Dam	_____
_____	Reservoir	_____
_____	Penstock	_____
_____	Turbine	_____
_____	Generator	_____
_____	Trash Racks	_____
_____	Spillway Gates	_____
_____	Storage	_____
_____	Hydropower Production	_____
_____	Cost	_____
_____	Environmental Effects	_____

Solar Energy

Before		After
_____	Fusion	_____
_____	Solar Radiation	_____
_____	Solar Collector	_____
_____	Space and Water Heating	_____
_____	Photovoltaics	_____
_____	Thermal Power Electricity	_____
_____	Environmental Effects	_____

Biomass

Before		After
_____	Formation	_____
_____	Burning	_____
_____	Garbage	_____
_____	Bacterial Decay	_____
_____	Methane and Landfill Gas	_____
_____	Fermentation	_____
_____	Ethanol and Gasohol	_____
_____	Environmental Effects	_____

Petroleum

Before		After
_____	Formation	_____
_____	History	_____
_____	Producing Oil	_____
_____	Oil Refining	_____
_____	Shipping Petroleum	_____
_____	Selling Petroleum	_____
_____	Demand	_____
_____	Environmental Effects	_____

Introduction to Energy

Before		After
_____	Btu, Quad	_____
_____	Supply and Demand	_____
_____	Renewable	_____
_____	Nonrenewable	_____
_____	Residential & Commercial	_____
_____	Industrial Sector	_____
_____	Transportation Sector	_____
_____	Energy Efficiency	_____

Electricity

Before		After
_____	Generator	_____
_____	Turbine	_____
_____	Transformer	_____
_____	Transmission Lines	_____
_____	Distribution Lines	_____
_____	Watt and Kilowatt	_____
_____	Kilowatt-hour	_____
_____	Alessandro Volta	_____
_____	Edison	_____
_____	Faraday	_____
_____	Pearl Street Power Station	_____
_____	Niagara Falls	_____
_____	Cost	_____
_____	Energy Efficiency	_____

Topic	Overall Rating	
	Before	After
Nuclear Energy	_____	_____
Coal	_____	_____
Forms of Energy	_____	_____
Geothermal Energy	_____	_____
Propane	_____	_____
Natural Gas	_____	_____
Wind	_____	_____
Hydropower	_____	_____
Solar Energy	_____	_____
Biomass	_____	_____
Introduction to Energy	_____	_____
Electricity	_____	_____
Petroleum	_____	_____
Your Total Rating	_____	

Energy Unit Exam—Part I

Read the sentence and choose the response that best completes the sentence or answers the question. Write the letter of the response you chose in the blank next to the question.

Science of Energy

_____1. All energy transformations can be traced back to this form of energy.
a. electrical b. chemical c. radiant d. nuclea.

_____2. Most of the world's energy sources are...
a. chemical b. elec rical c. nuclear d. mechanical

_____3. For photosynthesis to take place a plant must:
a. absorb energy b. give off energy c. repel energy

_____4. Electrical energy can be produced directly from...
a. mechanical energy c. radiant energy
b. chemical energy d. all three

_____5. The human body utilizes the chemical energy stored in food to produce which type(s) of energy?
a. mechanical b. electrical c. thermal d. all three

_____6. A mass of chemicals contains 100 units of potential energy. After an explosion, all the chemical energy is converted into thermal, radiant, and mechanical energy. What is the sum of these three forms of energy after the explosion?
a. 0 units b. 33 units c. 75 units d. 100 units

_____7. A fuel packet contains 1,000 grams of a nuclear fuel. How many grams will remain after the fuel has been used?
a. 1,001 grams b. 1,000 grams c. 999 grams

_____8. A substance requires just a small amount of energy to ignite it. The substance's activation energy would be considered...
a. high b. low c. have no effect on ignition

Consumption/Conservation

_____9. In 1994, which source of energy provided the nation with the largest portion of energy consumption?
a. petroleum b. natural gas c. coal d. all three about equally

_____10. Which of the following uses the greatest amount of energy in the American home each year?
a. lighting c. heating and cooling rooms
b. heating water d. refrigeration

_____11. For the same amount of light, fluorescent lights compared to incandescent lights use more, less, or the same amount of energy?
a. more b. less c. the same amount

_____12. If the Energy Efficiency Rating of an appliance increases, the amount of energy it consumes will...
a. increase b. decrease c. remain the same

_____13. Which of the following energy units represents the largest quantity of energy?
a. quad b. Btu c. megajoule d. megawatt-hour

_____14. In the summer, during what time period does the demand for energy peak?
a. 6:00 a.m. to noon c. 6:00 p.m. to midnight
b. noon to 6:00 p.m.

_____15. During the past 20 years, miles per gallon (MPG) ratings for new domestic cars have increased from 13 MPG to 27.5 MPG. Which factor listed below was MOST responsible for this increase in mileage?
a. radial tires c. fuel injection
b. reducing the weight of cars d. sleeker car body designs

_____16. Coal, petroleum (oil), natural gas, and propane are fossil fuels. They are CLASSIFIED as fossil fuels because:
a. they are burned to release energy and they cause air pollution
b. they are formed from the buried remains of plants and animals that lived millions of years ago
c. they are nonrenewable and will run out
d. they are mixed with fossils to provide energy

_____17. Gasoline is produced by the refining of which fossil fuel?
a. natural gas b. coal c. petroleum d. propane

_____18. Which is the cleanest-burning fossil fuel?
a. coal
b. natural gas/propane
c. petroleum
d. all are equally clean

_____19. Which fossil fuel has almost half its supply imported from foreign countries?
a. natural gas
b. petroleum
c. coal
d. all three equally

_____20. Liquid propane is used instead of natural gas in fueling appliances on recreational vehicles and hot air balloons. It's most often used in suburban and rural areas. Why is propane often used instead of natural gas?
a. it's safer
b. it's portable
c. it's cleaner
d. it's cheaper

_____21. The major use of coal in the United States today is to...
a. make electricity
b. fuel trains
c. heat buildings and homes
d. make chemicals

_____22. Which of the fossil fuels is a result of the decayed remains of ancient ferns, plants, and forests?
a. petroleum b. coal c. natural gas d. all three

_____23. What sector of the U.S. economy consumes a majority of the nation's petroleum?
a. residential b. commercial c. industrial d. transportation

_____24. Propane production is a result of cleaning or processing...
a. natural gas b. petroleum c. both natural gas and petroleum

_____25. Which gas can be easily changed into a liquid by using a moderate amount of pressure?
a. natural gas b. propane c. both at about the same pressure

_____26. Natural gas is transported mainly by...
a. pipelines b. trucks c. barges d. all three equally

_____27. A rise in railroad rates would affect the cost of which energy source the most?
a. petroleum b. coal c. natural gas d. uranium

_____28. The growth of the petroleum industry in its early years (1870-90) was largely due to a demand for...
a. lighting b. heating c. transportation d. electric power generation

_____29. Which sector of the U.S. economy consumes the greatest amount of natural gas?
a. residential b. transportation c. industry d. commercial

_____30. Global warming concerns center around burning fossil fuels that result in an increase in the level of which gas in the atmosphere?
a. ozone b. sulfur dioxide c. carbon dioxide d. nitrous oxide

_____31. Compared to today's conventional coal fired power plants, clean coal technology power plants, generating the same amount of electricity, are designed to use...
a. less energy b. more energy c. the same amount of energy

_____32. When will the U.S. Congress allow petroleum development in the Arctic National Wildlife Refuge?
a. production is already underway
b. by 1996
c. by 2001
d. no development is presently allowed or scheduled

_____33. Current efforts to increase the use of alternative fuels for transportation is PRIMARILY due to the desire for...
a. cleaner air
b. lower petroleum imports
c. cheaper energy costs
d. more jobs

_____34. Carbon and what other chemical element are common in fossil fuels, providing energy when burned?
a. nitrogen b. hydrogen c. sulfur d. oxygen

Renewables

_____35. Solar, biomass, geothermal, wind, and hydropower energy are all renewable sources of energy. They are CLASSIFIED as renewable because they...
a. are clean and free to use
b. can be converted directly into heat and electricity
c. can be replenished by nature in a short period of time
d. do not produce air pollution

_____36. Which of the following renewable sources of energy is NOT a result of the sun's energy striking the earth?
a. hydropower c. wind
b. geothermal d. biomass

_____37. What percentage of the nation's energy supply is provided by renewables?
a. 1% b. 8% c. 25% d. 50%

_____38. In 1994, which of the following renewable energy sources provided the nation with its largest share of energy?
a. wind b. solar c. geothermal d. hydropower

_____39. MOST biomass energy is a result of burning which of the following sources?
a. garbage b. wood c. agricultural waste d. equally from all three

_____40. Currently, the cost of producing electricity from photovoltaic cells when compared to traditional sources such as coal and nuclear is...
a. 25% less b. about the same c. twice the cost d. four times the cost

_____41. Currently, what percent of the sun's radiant energy is converted into ele trical energy when using a PV cell?
a. 10% b. 25% c. 50% d. 75%

_____42. Over the course of a year, what percentage of time does a windmill generate electricity?
a. 10% b. 25% c. 50% d. 75%

_____43. The thermal energy found below the earth's crust is primarily a result of...
a. continental drift c. heat remaining from the creation of the earth
b. radioactive decay of elements d. burning gases

_____44. If the use of geothermal, wind, and solar energy doubled in the next ten years, their contribution to total U.S. energy supply when compared to hydropower would be...
a. much more b. much less c. the same

_____45. Biomass energy is a result of photosynthesis. Which of the following is also a result of photosynthesis?
a. coal b. natural gas c. petroleum d. all three

_____46. The cost of generating electricity from trash when compared with using a fossil fuel is...
a. less b. more c. about the same

_____47. When compared to coal or nuclear power, the operating cost of generating electricity from hydropower is...
a. more b. less c. about the same

Electrical Power

_____48. During the past ten years the nation's demand for electrical energy has...
a. increased c. remained the same
b. decreased d. increased or decreased each year with no pattern

_____49. Currently, what percent of the chemical energy released from burning a fossil fuel is converted into electrical energy?
a. 33% b. 50% c. 75% d. 90%

_____50. Baseload power generating stations produce their power...
a. all day long c. only during peak hours
b. primarily at night d. only before and after peak times

_____51. Which energy source was responsible for generating over half the nation's electricity in 1994?
a. coal
b. uranium (nuclear)
c. hydropower
d. petroleum

_____52. Uranium is used to make electricity in a nuclear power plant. The uranium atoms give off energy when:
a. they combine and give off heat energy
b. they split and give off heat energy
c. they are burned and give off heat energy
d. they split and give off electrons

_____53. George Westinghouse prevailed over Thomas Edison to use AC power rather than DC for the nation's electric power system because AC power...
a. could be transported longer distances
b. was cheaper to produce
c. has more power per watt
d. was safer to use

_____54. The biggest portion of the total cost of nuclear power generation is...
a. the fuel
b. building the power plant
c. disposing of the waste
d. operating the reactor

_____55. Today, the civilian nuclear waste generated by the nation's 109 nuclear power plants is stored...
a. at 12 interim sites across the nation
b. at the power plants where the waste was produced
c. in the nation's only repository in Yucca Mountain, Nevada
d. reprocessed and made into breeder reactor fuel

_____56. Demand-side management lowers the need for building new power plants by...
a. shifting the demand for electricity to non-peak hours
b. reducing the energy requirements of electrical appliances and equipment
c. turning off power to customers when needed by the power company in return for lower rates
d. all three methods

_____57. Power plant size is measured using what unit of power?
a. kilowatt b. megawatt c. gigawatt d. septawatt

_____58. In a cogeneration power plant, the waste heat is used to...
a. generate additional electricity
b. condense steam into water
c. manufacture or process a product
d. all three jobs

_____59. When electrical power leaves the power plant to travel along transmission lines its voltage is increased because it...
a. travels faster
b. experiences less power loss
c. has a higher amperage
d. all three reasons

_____60. Superconductive materials will be used in the future to...
a. decrease voltage requirements
b. decrease energy losses due to heat
c. decrease power spikes
d. all three reasons

_____61. The reliability of a power system can be increased by...
a. increasing the amount of electricity people use
b. increasing the voltage while keeping the current constant
c. building additional power plants.
d. all three methods

_____62. Utility companies become members of power pools so they can...
a. store electricity for later use
b. purchase electricity from other companies when needed
c. increase the quality of their electricity
d. all three reasons

Energy Unit Exam—Part II

Essay Questions

Before writing the essays, your team should brainstorm all the important items that should be included in the essays. Please attach the list of ideas you brainstormed along with the written essays.

1. You have been asked to write an article for a local newspaper on the importance of saving energy in your home. Your article should begin with two paragraphs about the importance of energy conservation. Make sure your article contains at least one energy saving measure from the following areas: water heating, lighting, home heating/cooling, and cooking.

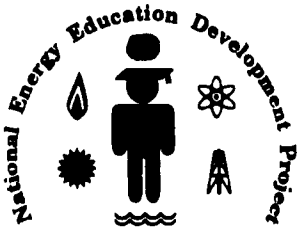
2. You have unearthed a time capsule that has been buried for 100 years. The capsule contains six items that show how energy was used by the average American family in 1895. Describe how each item was used, and the source of energy that made it work.

3. You turn on a lamp in your bedroom and the radiant energy from the lamp enables you to see. Starting with that radiant energy, trace all the energy flows and transformations that take place. Travel along the electrical wires from your house, back to the coal-fired power plant, and finish up with the primary form of all the earth's energy.

4. Your team has been selected by the United Nations to assist an underdeveloped country with its energy plan for the future. Affordable and environmentally acceptable energy supplies are needed to boost the standard of living of the country's inhabitants. Your task is to develop a list of at least ten questions that you need answered prior to developing an energy plan. List those questions and explain why this information is needed.

5. Your team has been asked to write a briefing paper on a current energy issue for the president of the United States. Make sure you include background or historical information, as well as the advantages and disadvantages of the different actions that can be taken. Choose one of the following issues: future electric power supply and demand, alternative fuels, solid waste management, or future supply and demand for petroleum.

6. As new businesses, industry, and families move into your area, electric power demand continues to grow. To avoid the need for additional power plants, you have been asked to develop a plan that will reduce electricity demand. Make sure your plan includes suggestions for reducing electricity use during peak load periods.



The National Energy Education Development Project
P.O. Box 2518
Reston, Virginia 22090

(703) 860-5029